

system.<sup>22</sup> While feeder link spectrum may be shared among satellites in the same system, it is "practically impossible to share feeder link spectrum with another system."<sup>23</sup> Sharing of feeder links among multiple Little LEO systems would result in random satellite visibility and unacceptable system outages.<sup>24</sup> Nevertheless, the framework proposed in the Notice would oblige Little LEO licensees to attempt the impossible -- to share feeder link spectrum on an intersystem basis. Also, as explained below, not all of the Commission's proposed systems have the bare minimum of feederlink spectrum.

**Sharing Concepts.** The Commission's proposed framework would require second round Little LEO licensees to share with existing first round licensees as well as various governmental users. However, sharing techniques proposed in the Notice, time division

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<sup>22</sup> Three satellites with overlapping footprints in a typical Little LEO system would require at least 150 kHz of spectrum dedicated on an exclusive basis to feeder link operations.

<sup>23</sup> See Little LEO Notice 8 FCC Rcd 6330 at ¶ 12; Below 1 GHz Negotiated Rulemaking Committee Report at 6.

<sup>24</sup> As the Commission notes, intersystem sharing of feeder link spectrum among multiple Little LEO systems would require Little LEO licensees

to pre-coordinate on an uplink signal structure, including packet rates, modulation techniques and signalling techniques. It would also be necessary to attempt to coordinate actual frequency use operationally on a real time basis, since there would be times when there would be a need to share the uplink data rate among numerous satellites (two or more from each system), thereby effectively resulting in system outages. *However, such intersystem operational coordination would be difficult since the satellites from the different systems will not be station-kept with respect to each other. The arguments of perigee and right ascension of ascending nodes will be uncoordinated, and will precess at different rates, making simultaneous visibility a likely but random event with respect to the busy hours of traffic loading.*

Little LEO Notice 8 FCC Rcd 6330 at n.28 (emphasis added); see also Below 1 GHz Negotiated Rulemaking Report at 6-7.

multiple access ("TDMA") and frequency division multiple access ("FDMA"), cannot feasibly support shared commercial operations of multiple licensed Little LEO systems as proposed.<sup>25</sup> Both TDMA and FDMA are mainly *intra*-system sharing techniques.<sup>26</sup> That is, they are useful *within* a particular system to effectively manage a limited communications resource, such as frequency spectrum. Multiple access among multiple Little LEO systems, in contrast, necessitates remote sharing of a communications resource under dynamic, real-time conditions. Under such conditions, a system controller must remain continuously aware of each user's needs. The amount of time that this information transfer requires creates an overhead and upper limit on efficient spectrum utilization. For FDMA and TDMA to operate on an *inter*-system basis, therefore, would require a master controller operating across system boundaries. Such an arrangement would deprive the various Little LEO systems of their independence. Such a limited arrangement, moreover, would not support even one fully competitive Little LEO system, let alone a multi-system Little LEO marketplace.

**2. The Particular Framework Proposed in the Notice Does Not Result in Three Equivalent and Functional Little LEO Systems**

In view of the technical issues described above, it is apparent that the three systems proposed by the Commission in the Notice would not, in fact, permit the implementation of three commercially viable systems. A summary of the detailed analysis of each system set forth in Exhibit 2 is provided below.

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<sup>25</sup> See Notice at ¶ 41.

<sup>26</sup> See Below 1 GHz Negotiated Rulemaking Report at 8-9.

**Little LEO-1.** This system uses, on a time-shared basis, a portion of the frequencies that were licensed to VITA.<sup>27</sup> As discussed above, the spectrum plan available to Little LEO-1 would create system outages that would limit the commercial viability of the system. Furthermore, the total amount of spectrum available for proposed Little LEO-1 is not sufficient to support even minimum dedicated feeder link operations, let alone a multiple, shared Little LEO environment as envisioned by the Notice. It is Final Analysis's view that this characteristic alone would make the Little LEO System-1 inadequate for commercial operations, even in low polling frequency markets.

\_\_\_\_\_Final Analysis's technical review also reveals that the service impact due to frequency sharing with VITA's one satellite is significant. Specifically, the average global operational time for the TYP SAT<sup>28</sup> constellation is 78 percent.<sup>29</sup> The service outage, moreover, is 22 percent.<sup>30</sup> A service outage of 22 percent would effectively impede the Little LEO-1 operator from offering the same real-time or near-real time service as first round Little LEO licensees.

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<sup>27</sup> In particular, 90 kHz of uplink in the 148-149.9 MHz band and 46.7 kHz of downlink in the 400.15-401 MHz band is proposed. See Notice at ¶¶ 45-48.

<sup>28</sup> "TYP SAT" refers to a representative Little LEO satellite constellation used for purposes of comparative analysis in the Autometrics Study.

<sup>29</sup> See Systems Analysis, Exhibit 2.

<sup>30</sup> Furthermore, the service outage in Little LEO-1 is variable over time and geographic location, creating service consistency issues and adding to operations cost and complexity. There are cases where up to four (4) satellites are restricted from operations for 100% of a 24-hour period, and other cases where all but five (5) of the twenty-four (24) satellite constellation are affected with over 20% service outage time at some point in a 24-hour period. This demonstrates the dynamics of the service outage condition, and the resulting impact on operations. See Systems Analysis, Exhibit 2.

The VITA service is limited by design in its coverage and the extent of the services it provides.<sup>31</sup> According to the first round Negotiated Rulemaking Report, "due to the different nature of its (VITA's) operation, VITA will not be utilizing separate feeder link spectrum." In addition, due to the limited market segment that VITA will address, its overall spectrum requirements are modest.<sup>32</sup> On the other hand, the commercial systems proposed by all second round applicants require much broader coverage for a much broader customer base and service offering. Therefore, this system is inadequate for a single operationally viable constellation let alone a fully competitive Little LEO system.

**Little LEO-2.** The Little LEO System-2 proposed in this Notice is based upon allocation of portions of the 148.0-149.9 MHz uplink and the 137-138 MHz downlink bands. A second round applicant licensed to this system would be required to engage in time-sharing with NOAA of the 137-138 MHz band, and with other users of 137-138 MHz downlink band such as Orbcomm, Starsys, S80-1, EUMETSAT, and Russia's METEOR system. Final Analysis's in-house technical review and the independent Autometric Study demonstrate that a service outage of 35 percent in proposed Little LEO-2 would prohibit the implementation of a fully competitive Little LEO system.

The Autometric Study shows that the average global operational time for the typical satellite ("TYP SAT") constellation is approximately 65 percent.<sup>33</sup> Thus, Little LEO-2

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<sup>31</sup> Below 1 GHz Negotiated Rulemaking Report at ¶ 12.

<sup>32</sup> The Negotiated Rulemaking Report also states that "because of the system technology and operational constraints, it would be practically impossible to share the gateway (feeder link) spectrum with another (NVNG) system."

<sup>33</sup> See Autometric Study, Attachment A.

would have a 35 percent service outage. Moreover, this service outage is variable over time and geographic location, creating service consistency issues and adding to operations cost and complexity as noted earlier. In all cases the outage affects more than 21 of the 24 satellites in the TYP SAT constellation, and varies greatly over time.<sup>34</sup> Furthermore, the approximate 65 percent service outage is for the mean latitude point which falls between 35- and 45-degrees latitude, and that the outage increases at latitudes above the mean point. This means that the service outages occur at a greater magnitude in the more populated regions of the earth where the predominance of users are located and, therefore, the problem is worse than the average figures might imply.

The 35-percent system outage for Little LEO-2 is caused by NOAA's overlapping constellation footprint.<sup>35</sup> This system outage will occur irrespective of available spectrum. Therefore, notwithstanding the Commission's stated belief that its proposal provides Little LEO-2 with sufficient spectrum,<sup>36</sup> the operational constraints imposed on Little LEO-2 by the 35-percent system outage will still exist due to NOAA's overlapping footprint.

Moreover, the proposed TDMA/FDMA method for accomplishing sharing in the 148.0-149.9 MHz uplink band has inherent problems when operating across systems.<sup>37</sup> As explained above, TDMA/FDMA is insufficient for such intersystem operation. Although Final Analysis has significant concerns regarding the service outages associated with time sharing of frequency blocks because of the competitive disadvantages created for second

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<sup>34</sup> See Systems Analysis, Exhibit 2.

<sup>35</sup> See Systems Analysis, Exhibit 2.

<sup>36</sup> Cf. Notice at ¶ 53.

<sup>37</sup> See Notice at ¶¶ 51, 65.

round applicants by service outages and increased operations costs, as discussed throughout these comments, they are technically possible to implement.<sup>38</sup>

In addition, the Commission's migration scenario projected for Little LEO-2 and the MetSats does not improve the competitive posture of the Little LEO-2 system.<sup>39</sup> At the time of migration, which is scheduled to occur in 2002, Little LEO-2 will lose exclusive use of the NOAA subbands. However, a second round TYP SAT will not have deployed a full constellation until that time. Thus, a TYP SAT will have just achieved full constellation deployment and will be prepared to offer near-real time services just at the time that the Little LEO-2 system loses exclusive use of the NOAA subbands under the Commission's migration scenario. Therefore, the migration scenario actually worsens the prospects that a second round licensee in this system will be able to implement a fully competitive system.

### **Little LEO-3.**

The Commission proposes that the Little LEO-3 system would share its uplink frequencies with U.S. and Russian RNSS systems (with possible additional coordination required with France), and operating in two 50 kHz segments.<sup>40</sup> Final Analysis has several significant concerns with this proposed system.

First, Little LEO-3 would not have sufficient uplink spectrum for a fully competitive system. The Commission proposes 100 kHz of uplink spectrum. However, as discussed

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<sup>38</sup> We note that the sharing scenario is technically feasible in that the Final Analysis's satellite, ground systems, and operations design will allow such an operations to occur. Final Analysis believes it is the only qualified second round applicant that can demonstrate this capability at this time.

<sup>39</sup> See Notice at ¶ 65.

<sup>40</sup> See Notice at ¶¶ 68-9.

above, each system would require a minimum of 50 kHz of dedicated spectrum per satellite in each direction for feeder links. A full constellation offering near real time coverage would require sufficient feeder link spectrum for at least three satellites within the same footprint at the same time in each direction (i.e., at least 150 kHz). Thus, Little LEO-3 would support more frequent coverage than the other systems, but still would not support a near real time system. This system design also requires the system operator to make difficult tradeoffs between feeder link spectrum and service uplink spectrum. Sharing with the Russian RNSS would further reduce available spectrum.

Little LEO-3 would be subject to significant coverage outage as well. The Autometric Study employed a model using five sun-synchronous meteorological satellites which characterize both the NOAA system and the DoD system. As mentioned in the discussion of Little LEO-2, above, this five-satellite constellation causes a 35 percent coverage outage into a typical satellite constellation.<sup>41</sup> This was based on a zero-degree elevation angle. A less than zero elevation angle as proposed in the Notice<sup>42</sup> increases the coverage outage by a substantial amount.

Moreover, to the extent that the Commission's estimate on the coverage outage was calculated based on user visibility from a fixed point, it does not accurately model the interference potential. A TYPSAT user may not be in view of the TYPSAT satellite yet the TYPSAT footprint and the DoD footprint may still overlap. Transmissions would not be permitted with the overlapping footprints. One need only consider the fact that a TYPSAT

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<sup>41</sup> This outage is irrespective of the amount of available spectrum and is directly related to the overlapping footprints of the satellite constellations.

<sup>42</sup> See Notice at ¶ 71.

footprint would exceed the size of the continental United States, to understand the extent of this problem.<sup>43</sup> Thus, it is clear that the outage problem with Little LEO-3 is worse than represented in the Notice.

For Little LEO-3, sharing requirements with DoD will increase the operations cost and complexity of a Little LEO system for the second round licensee.<sup>44</sup> The ninety-minute frequency change requirement will require additional operations team support, a dedicated voice and/or electronic link to DoD, and up to six (6) additional ground stations to command the satellite to change its frequency in the required 90 minute interval.<sup>45</sup> More importantly, the need to operate on two possible frequencies approximately 1 MHz apart will require enhancements to the terminal receiver so that it can be activated upon receipt of a beacon signal operating at either frequency. This will increase the cost and complexity of

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<sup>43</sup> The Commission states in the Notice at ¶ 70 that a user has access to a DoD three-satellite system for approximately 15.5 percent of the time, and therefore asserts that the remaining 84.5 percent of available time, or about twenty hours per day would be used by the Little LEO system-3. These are misleading statements and would produce incorrect results. For instance, as was shown in the Autometric Study, a single satellite for VITA produced an outage for TYP SAT constellation in excess of 22 percent. For a five satellite constellation, approximately 35 percent reduction in coverage results. Extrapolating these two scenarios for a three satellite constellation would result in about 30 percent coverage outage or a factor of two increase in coverage outage over that which is estimated by the Commission in the Notice at ¶ 70. Likewise, the numbers with a four constellation system are similarly misleading.

<sup>44</sup> Cf. Notice at ¶¶ 72-4.

<sup>45</sup> This is true for a single string configuration only. More sites are required should DoD require redundancy for higher reliability in effecting the change as directed.



the user terminal.<sup>46</sup> A ninety-minute implementation period also requires additional ground stations, and additional operations staff.<sup>47</sup>

Accordingly, Final Analysis's Systems Analysis shows that each of the systems proposed in the Notice has its own particular limitations due to system outages. Even aside from the outage problem, Little LEO-1 would not support a commercially viable Little LEO system. While Little LEO-2 and Little LEO-3 may support commercially viable operations, they possess constraints that limit efficient use of frequency pairings (particularly with respect to proper proportions of uplink and downlink spectrum) and do not adequately take into account the need for significant dedicated feeder links. Furthermore, Little LEO-3 imposes additional costs on ground segments, diminishing the value of Little LEO service as a low cost alternative. Slightly different spectrum pairings, as proposed in the next section, may alleviate some of the problems posed by the Commission's proposals.

**B. Alternative Band Plans May Ameliorate Some Limitations of the Commission's Proposal While Avoiding Mutual Exclusivity.**

Final Analysis has prepared proposals for three alternative band plans (described in the System Sharing Proposal attached hereto as Exhibit 3) that will accommodate unlicensed applicants and avoid mutual exclusivity. Two of the alternative band plans provide four fungible systems. The third alternative band plan would accommodate the varying requirements of second round Little LEO applicants. The alternative proposals suggest a

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<sup>46</sup> Final Analysis satellites (including FAISAT-2V authorized under an experimental license) have the capability to adjust to the required frequencies. We can make such a change within 90 minutes for the near-polar satellites, but for lower inclination satellites it requires longer periods with our currently planned ground stations.

<sup>47</sup> Cf. Notice at ¶ 75.

realignment of the Commission's proposed band pairings. These proposals would split the available downlink bands and avoid the inherent mutual exclusivity problems.<sup>48</sup>

Alternative Proposal 1 would enable the Commission to license each of four qualified second round applicants with separate and essentially equivalent spectrum, thus avoiding the issue of mutual exclusivity. Alternative Proposal 1 identifies eight separate spectrum segments: four downlinks and four uplinks. These uplink/downlink segments can be put together in any combination. The pairings may be chosen by the Commission or proposed by the qualified second round applicants. For regulatory purposes, these pairings may be considered to be fungible. The Commission also has recognized the efficiencies associated with creating equivalent and fungible orbital slots for purposes of licensing satellite-based services, and thereby avoiding mutual exclusivity problems.<sup>49</sup> For example, the Commission established permanent processing procedures in the DBS Processing Order, in which initial assignments of orbital locations and channels would be considered interchangeable and equivalent.<sup>50</sup> Because each digital broadcast satellite orbital slot allocation was structured as equivalent and fungible, if a particular DBS applicant's requested orbital slot assignment could not be accommodated, alternative orbital slots would be

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<sup>48</sup> In addition, Final Analysis has suggested a virtual constellation concept in earlier presentations to the Commission. The virtual constellation is still a viable interim solution for provisioning a coordinated service to the marketplace, provided that all qualified second round applicants would agree on a coordinated deployment and operational procedure for the virtual constellation.

<sup>49</sup> See Domsat 2-Degree Spacing Order.

<sup>50</sup> See Processing Procedures Regarding the Direct Broadcast Satellite Service, Memorandum Opinion and Order, 95 F.C.C.2d 250 (1983) ("DBS Processing Order").

assigned.<sup>51</sup> The Commission further acknowledged that structuring equivalent and fungible orbital locations and channels would promote the public interest goals of expediting delivery of DBS service to the public.<sup>52</sup> The alternative band-sharing proposals would facilitate efficient licensing of second round Little LEO applicants, thereby producing similar public interest benefits for the Little LEO marketplace.

Alternative Proposal 2 is similar to Alternative Proposal 1 in its approach to the uplink spectrum. However, Alternative Proposal 2 offers a different approach to the downlink spectrum, differentiating among qualified second round applicants as to their market focus. Some applicants do not require as much downlink as others because of their planned service applicants.

Alternative Proposal 2 would maximize spectrum efficiency by customizing the allocations to the market requirements of the qualified second round applicants. An additional benefit of this proposal would be achieved primarily by ensuring that DoD frequency modification restrictions affect only the ground stations and would not require costly modifications to subscriber terminals.

Under Alternative Proposal 3, each of the qualified second applicants would be granted a separate license. The licensees would be assigned the same downlink and uplink spectrum subject to band sharing criteria to be coordinated by licensees once the Commission

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<sup>51</sup> See 95 F.C.C.2d at 253-4.

<sup>52</sup> See Application of Hughes Communications Galaxy, Inc.; For Construction Permit to Establish a Direct Broadcast Satellite System, Memorandum Opinion and Order, File No. DBS-94-02, 1985 FCC LEXIS 2731 at ¶ 6 (released August 21, 1985) (citing Satellite Syndicated Systems, Inc. (DBS Second Round MO&O), FCC 84-608 at ¶ 4 (released December 6, 1984)).

has authorized this approach. Close coordination among the licensees is assumed in the proposal. As is true under Alternative Proposal 2, the DoD frequency change requirement would affect spectrum used in connection with feeder links rather than service links; thus the cost impact and service disruption would be minimized through avoidance of impact on user terminals.

Band sharing has been accepted as a viable approach to similar problems in other proceedings. For example, in the Big LEO Order, the Commission approved a negotiated band sharing plan that would enable four applicants to share the same frequencies.<sup>53</sup> Each of the four licensees were able to use the same CDMA system architecture.<sup>54</sup> Each of the CDMA systems also were provided with equal amounts of downlink and uplink spectrum.<sup>55</sup> Similarly, the alternative band-sharing plan proposed would afford each of the four licensees with an equivalent and interchangeable spectrum block.

The band sharing solution offered in Alternative Proposal 3 differs from the virtual constellation concept in that the band sharing solution does not require sharing of spacecraft platforms and/or launch vehicles. However, in the event that the Commission does not accept any of the Alternative Proposals offered herein, and sees no other solution to the potential mutual exclusivity problem in this proceeding, Final Analysis still believes the virtual constellation would be viable. Such a solution, however, would only be an interim

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<sup>53</sup> See Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, CC Docket NO. 92-166, Report and Order, 9 FCC Rcd 5936, 5953-4 ¶¶ 43-45 (1994) ("Big LEO Order").

<sup>54</sup> See id.

<sup>55</sup> See id.

one, and would have to be modified if and when additional spectrum becomes available making the implementation of full individual constellations possible.

#### **IV. ADDITIONAL SPECTRUM MUST BE ALLOCATED AND ASSIGNED TO LITTLE LEOS BEFORE FULLY COMPETITIVE SYSTEMS CAN BE IMPLEMENTED.**

As discussed above, assignment of additional spectrum to the second processing round is critical to enabling second round licensees to realize their full competitive potential. Assigning and allocating WRC-95 spectrum to the second processing round is in the public interest because it will facilitate more efficient use of the limited spectrum available from WARC-92 allocations. Moreover, because of the need for additional spectrum not subject to time sharing requirements in order to be able to provide near real time services, the Commission also should make any additional spectrum allocated at WRC-97 or future conferences available to Little LEO licensees from this processing round, to the extent needed to implement full near real time constellations. Accordingly, allocating and assigning WRC-95 spectrum and future WRC-97 spectrum to the second processing round is in the public interest.

##### **A. WRC-95 Spectrum Should Be Allocated and Assigned in this Proceeding.**

Final Analysis urges the Commission to grant second round licensees exclusive use of WRC-95 spectrum.<sup>56</sup> As Final Analysis demonstrates in its Alternative Proposals outlined in Exhibit 3 hereto, the availability of WRC-95 uplink spectrum facilitates more efficient use of WARC-92 spectrum and helps accommodate all second round applicants. Additionally, as

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<sup>56</sup> See Notice at ¶ 78. At WRC-95, the 399.9-400.05 MHz uplink band was allocated for Little LEO use worldwide, and the 455-456 MHz and 459-460 MHz uplink bands were allocated for use in Region 2. See *id.*

mentioned above and discussed in Final Analysis's System Analysis in Exhibit 2, Little LEO systems generally require proportionately more uplink than downlink spectrum. The lack of associated downlink spectrum is not a disadvantage and should not be a reason for not making WRC-95 spectrum available to second round applicants. Therefore, there are significant public interest reasons for allocating and assigning exclusive use of WRC-95 spectrum to the second round applicants.<sup>57</sup>

The Commission previously has found that allocation of additional spectrum to existing licensees without inviting additional applications is in the public interest where it would allow existing licensees to meet growth in demand and accommodate potential future changes in technical interference and system configuration requirements. In 1986, for example, the Commission allocated an additional 10 MHz of spectrum to the cellular radio service to complement the existing 40 MHz allocation (resulting in a total of 25 MHz per licensee per market in the cellular duopoly structure).<sup>58</sup> The Commission allocated the additional frequencies to cellular licensees without further application.<sup>59</sup>

As noted in the Notice, it is well-settled that the Commission has the authority to limit use of additional spectrum, upon an appropriate public interest finding, to a particular group

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<sup>57</sup> We note also that Final Analysis continues, as it has in the past, to commit substantial corporate resources in support of U.S. efforts to obtain international allocations for additional Little LEO spectrum at international conferences, including WRC-95 and WRC-97.

<sup>58</sup> See Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems, GEN. Docket No. 84-1231, Memorandum Opinion and Order, 2 FCC Rcd 1825, 1828 (1986).

<sup>59</sup> See id.

of licensees without opening that spectrum to competing applications.<sup>60</sup> Limiting spectrum allocation to a particular group of satellite applicants, moreover, is not inconsistent with Ashbacker requirements of a comparative hearing.<sup>61</sup>

In the AMSC Proceeding, for example, the Commission emphasized that, in determining that a consortium licensing approach would best serve the public interest, it could exercise its rulemaking authority consistent with the Supreme Court's holding in U.S. v. Storer Broadcasting,<sup>62</sup> to establish a threshold eligibility criterion for MSS license applicants.<sup>63</sup>

In contrast, opening WRC-95 spectrum to competing applications in another processing round is not in the public interest because it will delay the deployment of fully competitive Little LEO systems by second round licensees and could significantly postpone delivery to the public of the benefits of higher-end, real-time Little LEO applications.

**B. Any Spectrum Allocated for Little LEOs at WRC-97 Should be Made Available First To Licensees From this Proceeding.**

The Commission also should reserve additional Little LEO spectrum secured at WRC-97 and future conferences to existing licensees as required to permit implementation of

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<sup>60</sup> Notice at ¶ 78 (citing Rainbow Broadcasting Co. v. FCC, 949 F.2d 405, 409-410 (D.C. Cir. 1991)).

<sup>61</sup> See Ashbacker Radio Corp. v. FCC, 326 U.S. 327 (1945) ("Ashbacker").

<sup>62</sup> See 351 U.S. 192 (1956).

<sup>63</sup> See Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, 2 FCC Rcd 485 (1987) ("Consortium Order"); Tentative Decision, 6 FCC Rcd 4900 (1991); Final Decision, 7 FCC Rcd 266 (1992), aff'd sub nom. Aeronautical Radio, Inc. v. FCC, 983 F.2d 275 (D.C. Cir. 1993) (collectively, "AMSC Proceeding").

proposed near real time constellations. As discussed above and demonstrated in detail in Exhibits 1 (Market Analysis) and 2 (Systems Analysis) hereto, significant outages in service coverage will limit the ability of second round licensees to achieve fully competitive systems and meet market demand for near real-time applications. Consequently, availability of spectrum not encumbered by the time sharing requirement of WARC-92 spectrum is critical for implementation of fully competitive systems.

Additional spectrum secured at future conferences, including WRC-97, will provide essential spectrum for fully competitive, near real time system requirements such as dedicated feeder links as well as service uplink and downlink spectrum that does not require time sharing.<sup>64</sup> Additionally, international coordination requirements can result in modification and reduction of spectrum assigned by the FCC to U.S. licensees. Consequently, assignment of WRC-97 spectrum to existing licensees would facilitate protection of U.S. systems from possible "loss" of spectrum in international coordinations which might further constrain their ability to be fully competitive.

In the past, the Commission has found it in the public interest to reserve spectrum to be secured at future international radioconferences to existing licensees to accommodate flexibility and promote system development. In its interim DBS rulemaking in 1982, for example, the Commission issued interim DBS licenses prior to and conditioned on the then-

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<sup>64</sup> Item 3.1 of the WRC-97 Preliminary Agenda provides for consideration of allocations for feeder links for mobile satellite services. In the preparatory process, however, several parties have advocated the consideration as well of new allocations for service links. See WRC-95 Report, 78 Rad. Reg. 2d at n.151 (quoting Item 3.1 of WRC-97 Preliminary Agenda).



pending 1983 Regional Administrative Radio Conference ("RARC-83").<sup>65</sup> Noting the "long lead times required for satellite construction," the Commission concluded that delaying processing of applications until after RARC-83 "would probably mean that no DBS systems would go into operation until the end of this decade."<sup>66</sup> The Commission therefore concluded that starting the authorization process prior to and conditioned on RARC-83 under interim rules would permit implementation of the DBS service "several years earlier" and would "provide valuable experience that would allow . . . better-informed judgments concerning permanent regulations."<sup>67</sup>

The Commission also allocated spectrum to mobile satellite service prior to allocation decisions at subsequent international radioconferences where the satellite service would provide needed coverage to underserved populations and meet non-urban public safety, emergency and natural disaster needs. In the 1985 Allocation Decision reviewing the public interest factors weighing in favor of reallocating a portion of L-Band spectrum to shared use between land mobile satellite services ("MSS") and aeronautical mobile satellite services ("AMSS(R)") use prior to the 1987 World Administrative Radio Conference ("WARC-87"), the Commission stated that

The land mobile satellite service has much to offer. We attach a high premium to its promise of offering land mobile service to parts of the population that currently have no other alternative available. We recognize that it could meet non-urban public safety needs also, particularly during times

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<sup>65</sup> See Inquiry into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference, 90 F.C.C.2d 676 (1982) ("DBS RARC-83 Order").

<sup>66</sup> See 90 F.C.C.2d at 683.

<sup>67</sup> See id.

of emergency and natural disasters. The service appears technically feasible and economically viable. Based on the overall record before us, we find that it is in the public interest to allocate spectrum for mobile satellite service.<sup>68</sup>

Courts also have upheld the Commission's authority to allocate spectrum secured at future WRCs to satellite services, pursuant to the agency's reasoned decisionmaking powers. In the ARINC decision,<sup>69</sup> the Court of Appeals affirmed the Commission's 1985 Allocation Decision<sup>70</sup> to reallocate a portion of the L-Band spectrum to shared mobile satellite service ("MSS") and aeronautical mobile satellite service ("AMSS") use. ARINC, an applicant to provide AMSS(R), challenged the Commission's decision on the grounds that reallocation to shared MSS/AMSS(R) use was inconsistent with the subsequent ITU allocation of the L-band frequencies exclusively to AMSS use at the 1987 World Administrative Radio Conference ("WARC-87").<sup>71</sup> In affirming the Commission's allocation decision, the ARINC Court held that,

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<sup>68</sup> See 2 FCC Rcd at 1844.

<sup>69</sup> See Aeronautical Radio, Inc. v. FCC, 928 F.2d 428, 443 (D.C. Cir. 1991) ("ARINC").

<sup>70</sup> See Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, 2 FCC Rcd 1825 (1986) ("Allocation Order").

<sup>71</sup> Under the WARC-87 allocation, the L-Band was divided into separate blocks for land, aeronautical and maritime mobile satellite services. Believing that this block allocation approach unduly restricted allocations for mobile satellite services, the United States took a reservation to the WARC-87 allocation of the L-Band and stated its "intention to utilize these bands in the way most appropriate to satisfy its particular mobile satellite service requirements recognizing the priority of AMSS(R) and maritime safety communications." ARINC and the Commission agreed that this reservation had the effect of maintaining, as to the United States, the pre-1987 allocation of the L-Band frequencies exclusively to AMSS(R). See ARINC, 928 F.2d at 443 n.46 (citing ITU, Final Acts of the World Administrative Radio Conference for Mobile Services (MOB-87), Oct. 17, 1987, Final Protocol No. 58)).

[a]s the agency directly responsible for numerous international coordination efforts on behalf of civilian communication systems, the Commission has first-hand experience to support its judgment concerning the feasibility of its allocation scheme. We therefore defer to the Commission's belief that its allocation scheme will prove compatible with its international obligations.<sup>72</sup>

The Court also found the Commission's shared allocation scheme to be consistent with international regulations, noting that the ITU permits signatory nations to adopt nonconforming allocations so long as harmful interference is not thereby caused to conforming services, and that the Commission had stated its intention to engage in international coordination efforts which would enable the MSS licensee ("AMSC") to use its allotted frequencies without interfering with the systems of other countries.

It would significantly accelerate development of Little LEO markets in the public interest if the Commission adopts a policy establishing qualification criteria for any additional spectrum secured at WRC-97 that would give preference to existing licensees in need of additional spectrum to implement fully competitive near real time operations.

**V. THE COMMISSION SHOULD ADOPT LICENSING RULES THAT ELIMINATE BARRIERS TO ENTRY WHILE DISCOURAGING WAREHOUSING**

**A. The Commission Should Not Use Auctions**

**1. Mutual Exclusivity Must and Can Be Avoided**

The auction-based licensing scheme proposed in the Notice will not promote the Commission's primary statutory objective of "creat[ing] a regulatory environment facilitating the provision of efficient, innovative, and cost-effective satellite communications service in

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<sup>72</sup> See ARINC, 928 F.2d at 445.

the United States."<sup>73</sup> The Commission lacks authority under Section 309(j) to employ competitive bidding methods to award Little LEO licenses, where more spectrally efficient licensing alternatives exist. Furthermore, auctioning Little LEO licenses would not promote the statutory and policy objectives of Section 309(j).

It is well settled that a spectrum-based license or class of service is not subject to competitive bidding "if mutual exclusivity does not exist."<sup>74</sup> In addition, even where a potential for mutual exclusivity may exist the Commission nonetheless is first obligated under Section 309(j)(6)(E) to use alternative means by which "to avoid [such] mutual exclusivity in application and licensing proceedings."<sup>75</sup> The Commission first must identify and implement alternative measures for resolving potential mutual exclusivity in the Little LEO service before considering whether Little LEO spectrum would be amenable to auction. In the Big LEO Order, moreover, the Commission construed this provision to mean that "the Commission is obliged to attempt to eliminate mutual exclusivity."<sup>76</sup>

Precedent strongly supports, moreover, the duty and authority of the Commission to employ alternative sharing strategies efficiently to license spectrum, absent exercise of its auction authority and in order to avoid potential mutual exclusivity. The U.S. Court of Appeals for the District of Columbia ("Court of Appeals") has upheld the Commission's decision to reallocate a portion of spectrum in the upper L-band for mobile satellite services

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<sup>73</sup> See Notice at ¶ 10 (citing 47 U.S.C. § 151).

<sup>74</sup> See 47 U.S.C. § 309(j)(1); Implementation of Second 309(j) of the Communications Act -- Competitive Bidding, Second Report and Order, PP Docket No. 93-253, 9 FCC Rcd 2348, 2351 ¶ 19 (1994) ("Auction Second Report and Order").

<sup>75</sup> See 47 U.S.C. § 309(j)(6)(E).

<sup>76</sup> See 9 FCC Rcd at 5966 ¶ 71.

by granting a single MSS license to a consortium consisting of all willing and qualified applicants.<sup>77</sup> The Court of Appeals also has affirmed the Commission's authority to assign commercial television frequencies by means of a channel swap without opening the frequency to competing applications.<sup>78</sup> In the DBS context, moreover, the Commission has authorized licensees to exchange channels without resulting in mutual exclusivity.<sup>79</sup>

Final Analysis demonstrates herein that engineering, negotiation and regulatory solutions exist that would suffice to avoid potential mutual exclusivity in the second Little LEO licensing round and thereby avoid the need for competitive bidding. Specifically, as Final Analysis has demonstrated in Section III, above, there are several possible solutions to the problem of potential mutual exclusivity in this processing round. In particular, Final Analysis has proposed two alternative band plans that create four fungible systems as well as a virtual constellation concept pursuant to which all applicants could be equally accommodated on an interim basis. Final Analysis also has proposed a third alternative band plan pursuant to which the varying requirements of second round applicants can be accommodated through assignment by the Commission according to public interest considerations. Thus, the Commission clearly has abundant options for avoiding mutual exclusivity in licensing all four new second round applicants.

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<sup>77</sup> See Aeronautical Radio, Inc. v. FCC, 983 F.2d 275, (D.C. Cir. 1993).

<sup>78</sup> See Rainbow Broadcasting Co. v. FCC, 949 F.2d 405, 408-9 (D.C. Cir. 1991); see also Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Service in the Upper and Lower L-band, Notice of Proposed Rulemaking, IB Docket No. 96-132, FCC 96-259 at ¶¶ 23-24 (released June 18, 1996).

<sup>79</sup> See Processing Procedures Regarding the Direct Broadcast Satellite Service, 95 F.C.C.2d 250, 252 (1983).

In a number of contexts, the Commission has adopted special policies and processing rules to avoid mutual exclusivity. In the Domsat proceeding, for example, the Commission adopted flexible orbital assignment rules, such as interchangeable orbital slots and reduced or adjusted orbital spacing, to allow as many Domsat applicants to participate as possible, to accommodate their spectrum needs and to avoid delay associated with comparative hearings.<sup>80</sup> In delineating the public interest benefits of adopting the reduced orbital spacing requirements to avoid mutual exclusivity, the Commission stated that "the long lead times required for satellite construction and launch, which, when coupled with the time that would be consumed in comparative administrative hearings to award construction permits, would produce unacceptable delay in the provision of satellite service."<sup>81</sup>

Other examples include Commission processing procedures in the Digital Audio Radio Service ("DARS") and DBS. In the case of DARS, the Commission structured its allocation to treat all orbital locations as fungible and interchangeable to avoid mutual exclusivity. In DBS, the Commission established permanent processing procedures pursuant to which initial assignments of orbital locations and channels would be considered interchangeable and equivalent.<sup>82</sup> The Commission found that structuring equivalent and fungible orbital locations and channels would promote the public interest goals of expediting delivery of DBS service to the public and avoiding lengthy delays that would otherwise be incurred through

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<sup>80</sup> See Processing of Pending Space Station Applications in the Satellite Service, 93 F.C.C.2d 832 (1983).

<sup>81</sup> See 93 F.C.C.2d at 842-3.

<sup>82</sup> See Processing Procedures Regarding Direct Broadcast Satellite Service, 95 F.C.C.2d 250 (1983) ("DBS Processing Order").

comparative hearings.<sup>83</sup> This demonstrates the wide latitude the Commission has under its public interest touchstone in adopting rules in the satellite context to expedite licensing and avoiding time-consuming licensing alternatives. Final Analysis submits that there is no basis, in this proceeding, for resorting to auctions on the basis of mutual exclusivity.

**2. Even If Mutual Exclusivity Is Not Avoided The Commission Should Not Resort to Auctions**

Even if the Commission cannot avoid mutual exclusivity, auctions are inappropriate for licensing Little LEOs. As the Notice correctly acknowledges, the Commission must find that use of competitive bidding will promote certain statutory objectives set forth in Section 309(j) in order to auction Little LEO spectrum.<sup>84</sup> In order to license spectrum by competitive bidding, the Commission must find that it will promote four basic statutory objectives, which are: (i) speedy deployment of new technologies without administrative or judicial delays; (ii) promoting economic opportunity by disseminating licenses among a wide variety of applicants; (iii) recovering a portion of value of public spectrum made available for commercial use and avoiding unjust enrichment; and (iv) efficient and intensive use of the electromagnetic spectrum.<sup>85</sup> Using competitive bidding to distribute Little LEO spectrum would not advance these objectives. Auctions will delay the rapid deployment of Little LEO services. As demonstrated below, moreover, establishing strict eligibility criteria and due

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<sup>83</sup> See Application of Hughes Communications Galaxy, Inc.; For Construction Permit to Establish a Direct Broadcast Satellite System, Memorandum Opinion and Order, File No. DBS-94-02, 1985 FCC LEXIS 2731 at ¶ 6 (released August 21, 1985), (citing Satellite Syndicated Systems, Inc. (DBS Second Round MO&O), FCC 84-608 at ¶ 4 (released December 6, 1984)).

<sup>84</sup> See Notice at ¶ 83.

<sup>85</sup> See 47 U.S.C. §§ 309(j)(3)(A)-(D).

diligence milestones will better serve to prevent unjust enrichment and spur efficient use of Little LEO spectrum. In light of these more efficient regulatory alternatives, auctioning Little LEO spectrum thus would be contrary to the public interest.

First, auctioning Little LEO spectrum would not advance Section 309(j)(3)(A)'s goal of rapidly deploying new technologies "without administrative and judicial delays." The Notice incorrectly assumes, without support, that "an auction would allow [the FCC] to license [Little LEO] systems more quickly than other licensing methods."<sup>86</sup> For example, the Commission's decision to auction the new location and monitoring services ("LMS"), which are intended to provide terrestrial-based radiolocation, fleet tracking and asset management services analogous to space-based Little LEO services, has not resulted in speedy deployment of that technology or avoided administrative delay. Indeed, the Commission established LMS's predecessor, automatic vehicle monitoring, on an experimental basis in 1974<sup>87</sup> and established specific service rules in 1995.<sup>88</sup> However, an auction has not been conducted and only one multilateration LMS service operator is actually providing service, on a grandfathered basis. New auction rules would have to be established for Little LEOs, which process in and of itself would create significant administrative delay.<sup>89</sup>

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<sup>86</sup> See id. at ¶ 86.

<sup>87</sup> See Report and Order, Docket No. 18302, 30 Rad. Reg. 2d (P&F) 1665 (1974).

<sup>88</sup> See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, PR Docket No. 93-61, Report and Order, 10 FCC Rcd 4695 (1995).

<sup>89</sup> See id.



Because Little LEO service will be marketed globally, moreover, the Commission must consider the likelihood that administrative delay associated with domestic auctions would be multiplied on a global basis. In comparison, resolving potential mutual exclusivity among second round applicants by means of sharing and consortia arrangements would be far more efficient. Auctioning Little LEO spectrum domestically will only add another layer of administrative complexity to the international coordination process required in the satellite allocation context. Satellite authorizations are conditioned on the outcome of the international coordination process.<sup>90</sup> Completion of this coordination process can take five or more years.<sup>91</sup> Therefore, administrative delay associated with auctioning Little LEO spectrum domestically must be multiplied by any delay associated with the international coordination process.<sup>92</sup>

Other serious problems would arise in any effort to fashion auction rules for the Little LEO services. These include the near impossibility of fairly valuing a U.S. license for a global Little LEO system which may be subject to unknown numbers and varieties of foreign auctions as well, the lack of a foreseeable ending to a potentially global auction process, and

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<sup>90</sup> Spectrum coordination process includes: (a) advance publication, where a country makes known its plans to implement a satellite system in particular frequencies; (b) coordination, where technical agreements are negotiated and reached among countries to ensure the interference-free operations of the planned satellites; and (c) notification and recording of the frequency assignment in the Master International Frequency Register by the ITU Radiocommunication Bureau.

<sup>91</sup> See Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Service in the Upper and Lower L-band, Notice of Proposed Rulemaking, IB Docket No. 96-132, FCC 96-259 at ¶ 7 (released June 18, 1996); see also Little LEO Notice at ¶ 32.

<sup>92</sup> Furthermore, if the Commission decides to auction Little LEO spectrum and foreign countries also use auctions, there is potential for even further delay. See, e.g., Martin Spicer, International Survey of Spectrum for Cellular and PCS (September 1996).